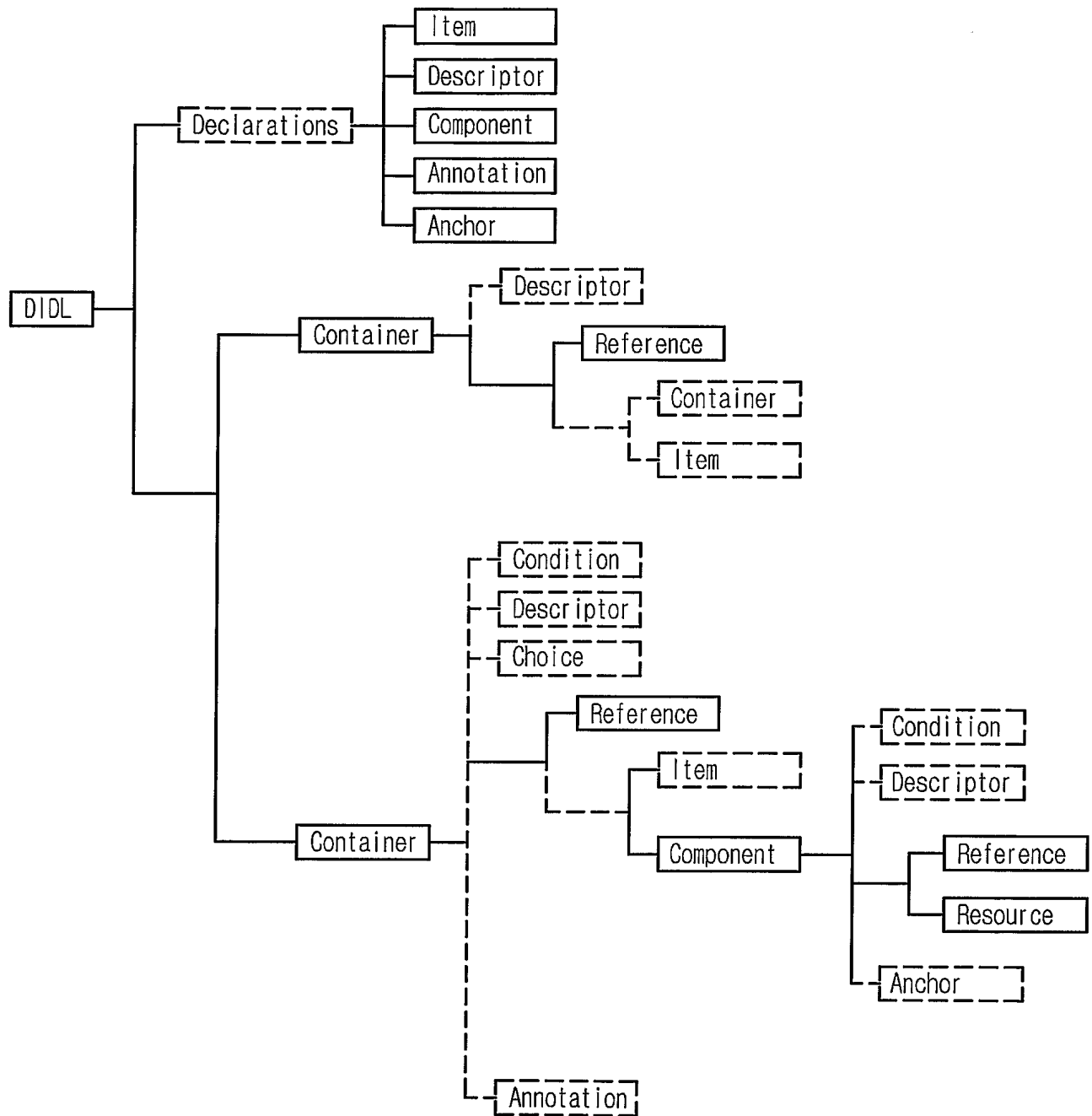


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FIG. 1  
(PRIOR ART)

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## FIG.2

<i>Relation Name</i>	<i>Inverse Relation</i>	<i>Definition</i>	<i>Properties</i>	<i>Examples (informative)</i>
precedes	follows	B precedes C if and only if $B.b < C.a$	Transitive	BBB CCC
meets	metBy	B meets C if and only if $B.b = C.a$	Anti-symmetric	BBBCCC
overlaps	overlappedBy	B overlaps C if and only if $B.a < C.a$ AND $B.b > C.a$ AND $B.b < C.b$		BBB CCC
contains	during	B contains C if and only if ( $C.a > B.a$ AND $C.b \leq B.b$ ) OR ( $C.a \geq B.a$ AND $C.b < B.b$ )	Transitive	Any of the examples for strict Contains, startedBy, and finishedBy.
strictContains	strictDuring	B strictContains C if and only if $C.a > B.a$ AND $C.b < B.b$	Transitive	BBBBBBB CCCC
starts	startedBy	B starts C if and only if $B.a = C.a$ AND $B.b < C.b$	Transitive	BBBB CCCCC
finishes	finishedBy	B finishes C if and only if $B.a > C.a$ AND $B.b = C.b$	Transitive	BBBB CCCCC
coOccurs	coOccurs	B coOccurs C if and only if $B.a = C.a$ AND $B.b = C.b$	Equivalence	BBB CCC

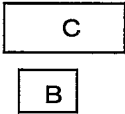
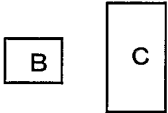
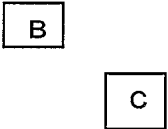
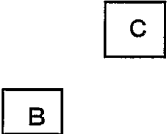
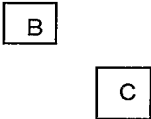
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## FIG.3

<i>Relation Name</i>	<i>Definition</i>	<i>Examples (informative)</i>
contiguous	$A_1, A_2, \dots A_n$ contiguous if and only if $A_i.b = A_{i+1}.a$ for $i=1, \dots, n-1$ That is, $A_1, A_2, \dots A_n$ contiguous if and only if they are temporally disjoint and connected.	$A_1 A_1 A_1 A_2 A_2 \dots A_n A_n A_n$
sequential	$A_1, A_2, \dots A_n$ sequential if and only if $A_i.b \leq A_{i+1}.a$ for $i=1, \dots, n-1$ That is, $A_1, A_2, \dots A_n$ sequential if and only if they are temporally disjoint and not necessarily connected.	$A_1 A_1 A_1$ $A_2 A_2 \dots A_n A_n A_n$
coBegin	$A_1, A_2, \dots A_n$ coBegin If and only if $A_i.a = A_{i+1}.a$ for $i=1, \dots, n-1$ That is, $A_1, A_2, \dots A_n$ coBegin if and only if they start at the same time.	$A_1 A_1 A_1$ $A_2 A_2$ $\dots$ $A_n A_n A_n$
coEnd	$A_1, A_2, \dots A_n$ coEnd if and only if $A_i.b = A_{i+1}.b$ for $i=1, \dots, n-1$ That is, $A_1, A_2, \dots A_n$ coEnd if and only if they end at the same time.	$A_1 A_1 A_1$ $A_2 A_2$ $\dots$ $A_n A_n A_n$
parallel	$A_1, A_2, \dots A_n$ parallel if and only if the intersection of $A_1, A_2, \dots A_n$ has one non-empty interior.	$A_1 A_1 A_1$ $A_2 A_2$ $\dots$ $A_n A_n A_n$
overlapping	$A_1, A_2, \dots A_n$ overlapping if and only if the union of $A_1, A_2, \dots A_n$ is connected and each $A_i$ intersects at least one other $A_j$ with non-empty interior.	$A_1 A_1 A_1$ $A_2 A_2 A_2 A_2$ $\dots$ $A_n A_n A_n$

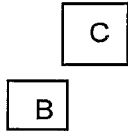
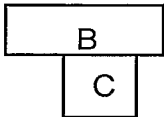

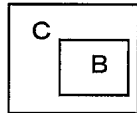
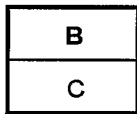
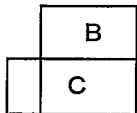
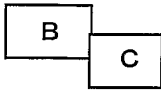
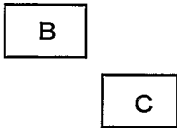
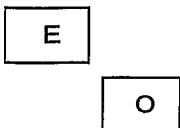
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## FIG.4A

<i>Relation Name</i>	<i>Inverse Relation</i>	<i>Definition</i>	<i>Properties</i>	<i>Informative Examples</i>
south	north	B south C if and only if ( $B.x.a \geq C.x.a$ AND $B.x.b \leq C.x.b$ ) OR ( $B.x.a \leq C.x.a$ AND $B.x.b \geq C.x.b$ ) AND $B.y.b \leq C.y.a$	Transitive	
west	east	B west C if and only if $B.x.b \leq C.x.a$ AND ( $B.y.a \geq C.y.a$ AND $B.y.b \leq C.y.b$ ) OR ( $B.y.a \leq C.y.a$ AND $B.y.b \geq C.y.b$ ) )	Transitive	
northwest	southeast	B northwest C if and only if $B.x.b \leq C.x.a$ AND $B.y.a \geq C.y.b$	Transitive	
southwest	northeast	B southwest C if and only if $B.x.b \leq C.x.a$ AND $B.y.b \geq C.y.a$	Transitive	
left	right	B left C if and only if $B.x.b \leq C.x.a$	Transitive	

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## FIG.4B

below	above	B below C if and only if $B.y.b \leq C.y.a$	Transitive	
over	under	B over C if and only if $((B.x.a \leq C.x.a \text{ AND } B.x.b > C.x.a) \text{ OR } (B.x.a > C.x.a \text{ AND } B.x.a < C.x.b))$ AND $B.y.a = C.y.b$	Transitive	
equals	equals	B equals C if and only if $B = C$	Equivalence	
inside	contains	$B_1, B_2, \dots B_n$ inside C if and only if $(B_1, B_2, \dots B_n) \subseteq C$	Partial order	
covers	coveredBy	$B_1, B_2, \dots B_n$ covers C if and only if $B_1 \cup B_2 \cup \dots \cup B_n \cup C \supset C$ AND $(B_1 \cup B_2 \cup \dots \cup B_n \cup C) \neq C$	Transitive	
overlaps	overlaps	B overlaps C if and only if $B \cap C$ has non-empty interior	Symmetric	
touches	touches	$B_1, B_2, \dots B_n$ touches C if and only if $B_1 \cup B_2 \cup \dots \cup B_n \cup C$ is connected	Equivalence	
disjoint	disjoint	B disjoint C if and only if $B \cap C = \emptyset$	Symmetric	
separated	separated	E separated O if and only if $E \cap \text{cl}(O) = \emptyset$ AND $\text{cl}(E) \cap O = \emptyset$ where $\text{cl}(S)$ indicates the closure of a set S.	Symmetric	

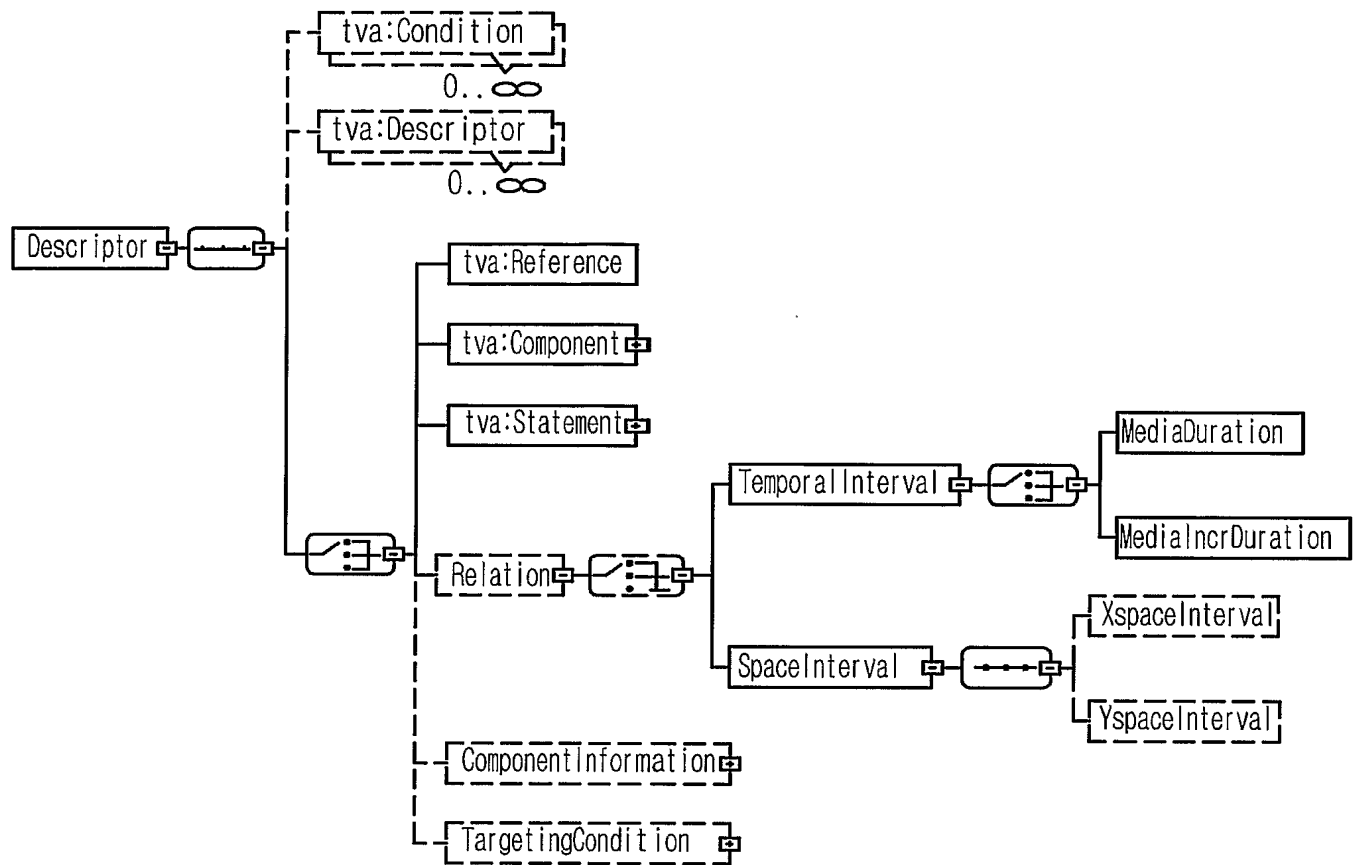
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## FIG.5

```
<Selection select_id="Temp_precedes">
<Descriptor>
<Relation type="urn:tva:metadata:phase2:CS:TemporalRelationCS:2005:precedes">
<TemporalInterval>
<MediaIncrDuration mediaTimeUnit="PT1N1000F">3000
</MediaIncrDuration>
<!-- <MediaDuration>PT3S</MediaDuration>-->
</TemporalInterval>
</Relation>
</Descriptor>
</Selection>
```

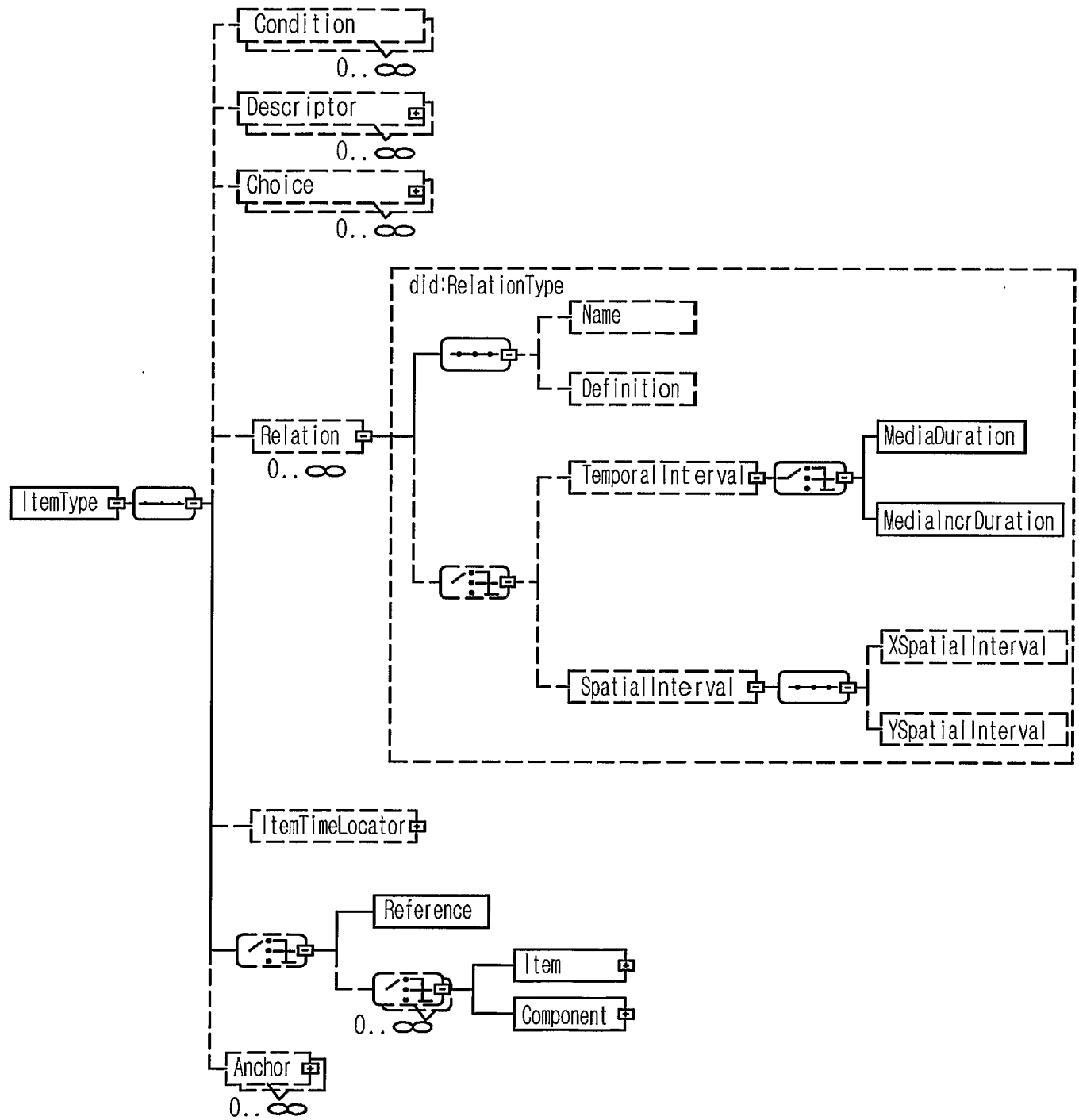
## FIG.6

```
<Selection select_id="Spatial_west">
<Descriptor>
<Relation type="urn:tva:metadata:phase2:CS:SpatialRelationCS:2005:west">
<SpaceInterval spaceIntervalUnit="S1 N1000F">
    <XspaceInterval>200</XspaceInterval>
</SpaceInterval>
</Relation>
</Descriptor>
</Selection>
```

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FIG. 7A

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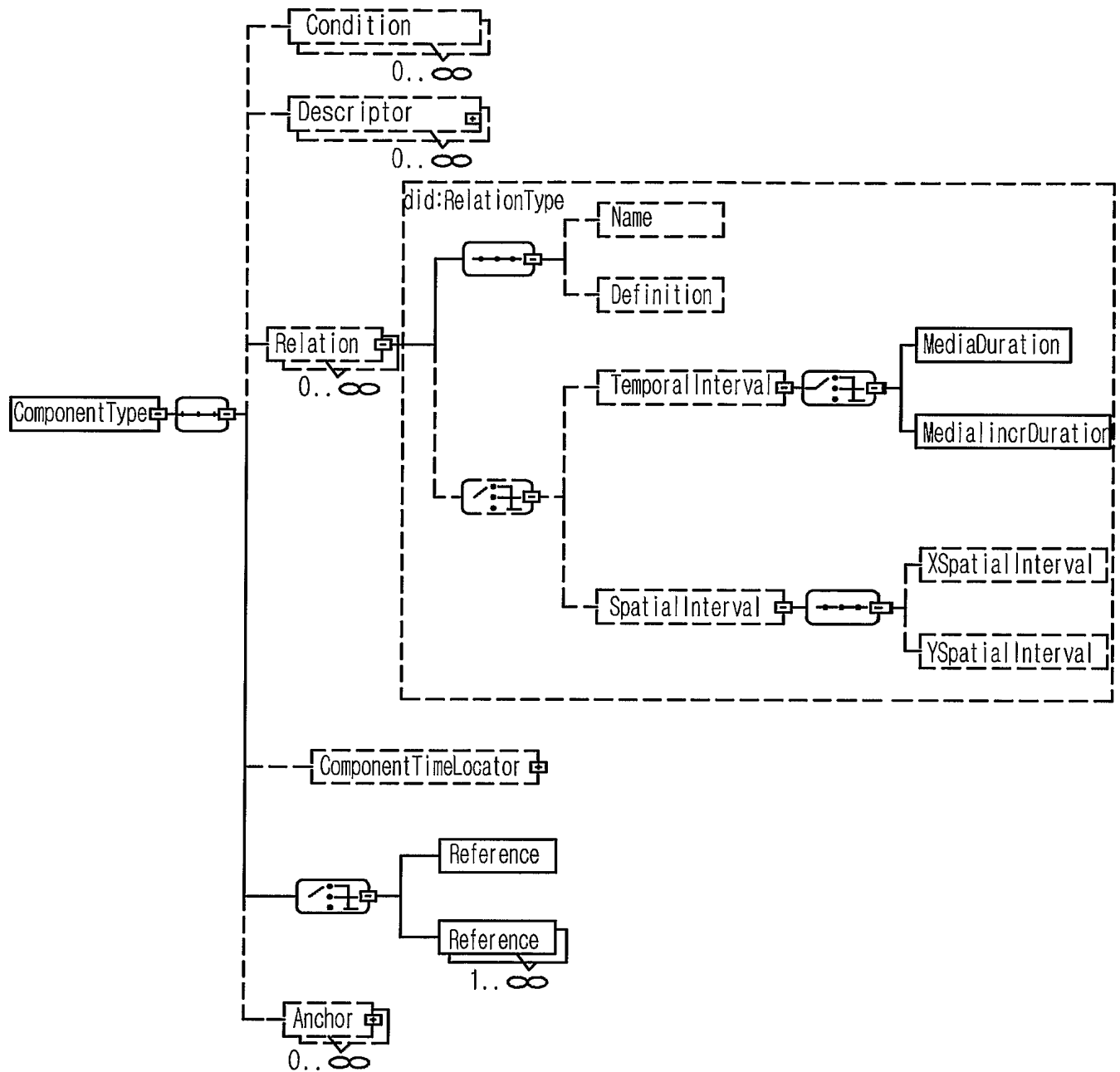
FIG. 7B





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FIG. 7C



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## FIG.8

```
<element name="Relation" minOccurs="0">
  <complexType>
    <choice minOccurs="0">
      <element name="TemporalInterval">
        <complexType>
          <choice>
            <element name="MediaDuration" type="mpeg7:mediaDurationType"/>
            <element name="MediaIncrDuration" type="mpeg7:MediaIncr
DurationType"/>
          </choice>
        </complexType>
      </element>
      <element name="SpaceInterval">
        <complexType>
          <sequence>
            <element name="XspaceInterval" type="integer" minOccurs="0"/>
            <element name="YspaceInterval" type="integer" minOccurs="0"/>
          </sequence>
          <attribute name="spaceIntervalUnit" type="tva:SpatialRel
IntervalType"/>
        </complexType>
      </element>
    </choice>
    <attribute name="type" type="mpeg7:termReferenceType" use=
"optional"/>
  </complexType>
</element>
```

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## FIG. 9A

```
<TVAMain xmlns="urn:tva:metadata:2002"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2001"
xmlns:dia="urn:mpeg:mpeg21:2003:01-DIA-NS"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:tva:metadata:2002 ./PackageWithDID7.xsd">
<ProgramDescription>
<PackageInformationTable>
<Container id="Educational_Package">
<Item>
<Choice minSelections="1" maxSelections="1">
<Selection select_id="Phrase_One">
<Descriptor>
<Statement mimeType="text/plain"> Phrase One</Statement>
```

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## FIG. 9B

```
</Descriptor>
</Selection>
<Selection select_id="Phrase_Two">
<Descriptor>
<Statement mimeType="text/plain">Phrase Two</Statement>
</Descriptor>
</Selection>
</Choice>
<Choice minSelections="1" maxSelections="2">
<Selection select_id="Selection_Optional">
<Descriptor>
<Relation type="urn:tva:metadata:cs:SelectionCS:
2003:Optional"/>
</Descriptor>
</Selection>
<Selection select_id="Temp_coBegin">
<Descriptor>
<Relation type="urn:mpeg:mpeg7:cs:TemporalRelationCS:
2001:coBegin"/>
</Descriptor>
</Selection>
<Selection select_id="Temp_precedes">
<Descriptor>
<Relation type="urn:mpeg:mpeg7:cs:TemporalRelationCS:
2001:precedes">
<TemporalInterval>
<MediaIncrDuration mediaTimeUnit="PT1N1000F">
3000</MediaIncrDuration>
<!-- <MediaDuration>PT3S</MediaDuration>-->
</TemporalInterval>
</Relation>
```

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## FIG. 9C

```

</Descriptor>
</Selection>
<Selection select_id="Spatial_west">
<Descriptor>

```

```

<Relation type="urn:mpeg:mpeg7:cs:SpatialRelationCS:
2001:west">
<SpaceInterval spaceIntervalUnit="S1N1000F">
<XspaceInterval>200</XspaceInterval>
</SpaceInterval>
</Relation>

```

```

</Descriptor>
</Selection>
</Choice>
<Choice minSelections="1" maxSelections="1">
<Selection select_id="Audio_WAV">
<Descriptor>

```

```

<TargetingCondition>
<TerminalCondition xsi:type="dia:CodecCapabilitiesType">
<dia:Decoding xsi:type="dia:AudioCapabilitiesType">
<dia:Format href="urn:mpeg:mpeg7:cs:FileFormatCS
:2001:9">
<mpeg7:Name xml:lang="en">WAV</mpeg7:Name>
</dia:Format>
</dia:Decoding>
</TerminalCondition>
</TargetingCondition>

```

```

</Descriptor>
</Selection>
<Selection select_id="Audio_MP3">
<Descriptor>
<TargetingCondition>
.....
</TargetingCondition>

```

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## FIG. 9D

```
</Descriptor>
</Selection>
</Choice>
<Item>
  <Condition require="Spatial_west"/>
  <Item>
    <Condition require="Temp_precedes"/>
    <Item>
      <Condition require="Phrase_One Temp_coBegin"/>
      <Item>
        <Component>
          <Condition require="Audio_WAV"/>
          <Resource mimeType="audio/wav"
            crid="crid://www.imbc.com/EnglishEducation/
            FirstPhrase" imi="imi:1"/>
        </Component>
        <Component>
          <Condition require="Audio_MP3"/>
          <Resource mimeType="audio/mp3"
            crid="crid://www.imbc.com/EnglishEducation/
            FirstPhrase" imi="imi:2"/>
        </Component>
      </Item>
    </Item>
  </Item>
</Item>
```

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FIG. 9E

```
<Component>
  <Resource mimeType="text/plain"
    crid="crid://www.imbc.com/EngScriptperPhrase/FirstPhrase"/>
</Component>
<Component>
  <Resource mimeType="text/plain"
    crid="crid://www.imbc.com/KorScriptperPhrase/FirstPhrase"/>
</Component>
</Item>
<Item>
  <Condition require="Phrase_Two Temp_coBegin"/>
  <Component>
    <Resource mimeType="audio/wav"
      crid="crid://www.imbc.com/EnglishEducation/SecondPhrase"/>
  </Component>
  <Component>
    <Resource mimeType="text/plain"
      crid="crid://www.imbc.com/EngScriptperPhrase/SecondPhrase"/>
  </Component>
  <Component>
    <Resource mimeType="text/plain"
      crid="crid://www.imbc.com/KorScriptperPhrase/SecondPhrase"/>
  </Component>
</Item>
```

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## FIG. 9F

```
</Item>
<Item>
  <Condition require="Selection_Optional"/>
  <Component>
    <Resource mimeType="image/gif"
      crid="crid://www.imbc.com-/ImagesforLinkedMaterial/EnglishBook"/>
  </Component>
  <Component>
    <Resource mimeType="image/gif" crid="crid://www.imbc.com-
      /ImagesforLinkedMaterial/StudyMethod"/>
  </Component>
</Item>
</Item>
</Item>
</Container>
</PackageInformationTable>
</ProgramDescription>
</TVAMain>
```



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FIG. 10

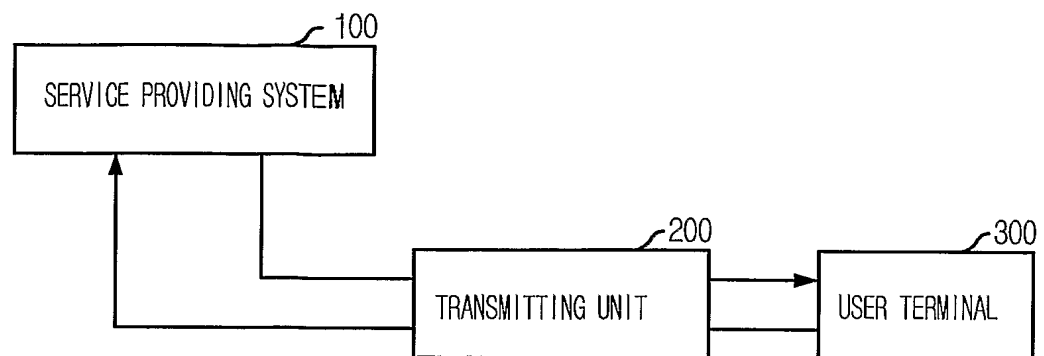


FIG. 11

